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**INWARD FDI AND PRODUCTIVITY PERFORMANCE IN CANADIAN
INDUSTRIES: DOES THE COUNTRY OF ORIGIN MATTER?**

Eric C.Y. Ng and Malick Souare,
Industry Canada

Working Paper 2011-03

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Abstract

This paper investigates whether the productivity impact of inward foreign direct investment (FDI) in Canada differs by the country of origin. Using panel data on Canadian industries, we find that only FDI originated from the United States (U.S.) has had a significant positive impact on productivity growth in industries in which it operates. This could be either because of higher productivity of the US-owned firms or technological knowledge spillovers from the U.S.; or a combination of the two effects. A further investigation also shows that foreign investment from the U.S. generates positive productivity spillovers to Canadian-owned firms within industries.

Key words: foreign direct investment, foreign multinationals, TFP growth, panel data

Résumé

L'étude a pour but de déterminer si l'effet des investissements directs étrangers au Canada sur la productivité varie selon le pays d'origine des investissements. D'après les données de panel sur les industries canadiennes, seuls les investissements directs des États-Unis (É.-U.) au Canada ont une incidence positive et significative sur la croissance de la productivité des industries visées par ces apports de capitaux. Ce résultat peut s'expliquer par la productivité accrue des entreprises appartenant à des intérêts américains, par le transfert des connaissances techniques des entreprises américaines aux entreprises canadiennes, ni encore par une combinaison de ces deux facteurs. En outre, d'après une analyse plus poussée, les investissements en provenance des É.-U. ont des retombées positives sur la productivité des entreprises appartenant à des intérêts canadiens au sein des industries ciblées par les investissements.

Mots clés : investissement direct étranger, multinationales étrangères, croissance de la productivité totale des facteurs, données de panel

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1. Introduction

There is a large and growing empirical literature assessing the impact of inward foreign direct investment (FDI) on the host-country's productivity performance. Although there are somewhat conflicting results, the literature tends to suggest on balance that FDI (or foreign affiliate/multinational enterprise (MNE))¹ leads to increased productivity in the recipient countries.

There are several ways in which inward FDI or the entrance/existence of foreign firms might improve productivity in the host countries where they operate. First, as a result of their alleged superior knowledge (e.g. managerial expertise and superior technological capabilities), foreign affiliates might exhibit higher productivity than domestically-owned firms. Therefore, one would expect FDI to enhance overall industry productivity performance through this direct effect of productive efficiency in foreign affiliates.

Second, the presence of FDI in any particular industry might have a positive spillover effect on the productivity of domestic firms within the same industry. The domestic firms benefit from foreign affiliates' knowledge or technological skills, and therefore improve their productivity. This is referred to intra-industry spillovers in the literature.

The third channel suggests that a given domestic industry may also (indirectly) enhance its productivity from the presence of FDI in other related industries (both upstream and downstream industries). For FDI in upstream industries, foreign-controlled firms as the suppliers of intermediate inputs provide the industry with more varieties of, better quality or less costly intermediate inputs. In addition, FDI-controlled firms may also provide better customer service. For FDI in downstream industries, foreign-controlled firms as purchasers of intermediate inputs often provide technical assistance to their input suppliers in order to raise the quality of their products. They may also help suppliers with management training, and sometimes find new customers for their suppliers. Together, these externalities are referred to inter-industry spillovers.

However, largely because of data limitations, there has been little emphasis (in the existing literature) on whether these aforementioned (potential) productivity impacts of FDI in the recipient country depend on the sources of investment or the nationality of the foreign affiliates. In fact, one might incline to believe that the contributions of FDI originated from different countries may differ significantly due to substantial differences

¹ A transnational investment is typically classified as direct investment if a foreign investor holds at least 10% of a local firm's voting equity; and a foreign affiliate is a business in which there is FDI. As for a foreign-controlled/owned firm, it entails the ownership of a majority (50% or more) of the voting equity in a firm. A MNE is a company that owns and controls firms in at least two countries. In practice, however, a large proportion of FDI capital involves majority-owned firms. For instance, Statistics Canada reports that majority owned firms accounted for over 90% of Canada's inward FDI stock in 2005. In this paper, we use the terms FDI, foreign affiliate and MNE interchangeably.

in the sophistication of technology/knowledge, managerial practices, motives and strategic approaches across countries. For example, many observers contend that Japanese MNEs behave differently from other MNEs, because of their protected domestic base, industrial pattern, or because they have different culture and institutional structure (see, e.g., Graham and Krugman, 1995). A case in point is that Japanese FDI generally enters labour-intensive industries producing standardized products, while the US MNEs usually operate in most technologically sophisticated industries that are more capital-intensive in nature (see Ozawa (1972), Kim *et al.* (2003), Banga (2004)). Nonetheless, as mentioned earlier, a limited number of FDI studies have tried to disaggregate its productivity impact across different country sources and compare them. Thus, this paper contributes to this strand of literature by examining (using industry panel data) whether FDI from different countries or regions has a differential impact on the productivity growth in Canada.

Exploring the home-country specific effect is particularly relevant as most countries' policies towards FDI are moving from an emphasis on review and screening of investment proposals to ones of active promotion.² As rightfully underlined in Globerman, Ries and Vertinsky (1994), the knowledge of whether the home country of a foreign affiliate affects the benefits of FDI to the host country may help to target more effectively a country's promotion efforts to attract FDI and maximize its benefits from potential inward investments.

The rest of the paper is organized in the following way. Section 2 documents some facts about the characteristics and performance of FDI in Canada. The literature review is discussed in Section 3. Section 4 describes the empirical models and the measurements and sources of data used in this paper. The empirical estimation results are then presented in Section 5. Section 6 concludes the paper.

2. Facts about FDI in Canada: Characteristics & Performance

Figure 1 shows both Canada's FDI inflows and outflows for the last 15 years. The value of FDI flows into Canada increased from a meagre \$6.1 billion in 1993 to \$99.2 billion in 2000, and then declined substantially until 2004 where there was a net repatriation of assets of foreign-owned companies operating in Canada. The FDI inflows increased over the last three years, reaching \$116.7 billion in 2007, the highest level in any year since 1993. As for the Canadian direct investment abroad (CDIA), it declined from a peak in 2000 (\$66.4 billion), but has also increased in recent years and was valued at nearly \$58 billion in 2007.

² In fact, attracting FDI has become an integral part of national development strategies in many economies as they believe the benefits from FDI inflows outweigh its drawbacks. The UNCTAD in its World Investment Report (2006) highlights that there were 205 FDI related policy changes across the world in 2005, and most of these changes made conditions more favourable for foreign companies to enter and operate.

As shown in Figure 2, both Canada's inward and outward FDI stocks have increased steadily over the past 20 years. However, with an increase by about 7 times during 1987-2007, outward FDI stock from Canada grew faster than inward stock (increasing by about 5 times). Since 1997, Canada has been a net outward investor. In 2007, the net direct investment position (the difference between CDIA and FDI in Canada) was about \$14 billion, significantly down from \$92 billion a year earlier.

The United States continues to be the dominant foreign investor in Canada (Table 1). In 2007, the US accounted for 58% of Canada's inward FDI stock (down from 67.2% in 1995). The United Kingdom was the second highest source of FDI in Canada with about 11% (which is slightly up from 8.4% in 1995). These two countries combined with the Netherlands, France, and Switzerland held just over 81% of FDI in Canada in 2007. Other European countries, Japan and Brazil were also among the top 10 sources.

The industrial distribution of Canadian inward FDI stock (in Table 2) indicates that in 2007 three industries, namely finance and insurance, energy, and metallic minerals & metal products, accounted for about 51% of the total stock of FDI in Canada. This proportion was up from 35% in 1995, and 42% in 2002. Between 2002 and 2007, the highest decline in share was observed in the food, beverage and tobacco and transportation equipment industry, falling about 5 and 4 percentage points, respectively.

Are there any differences in terms of the performance of inward FDI in Canada from different countries? Also, how is the performance of inward FDI compared with that of Canadian-owned firms? To address these questions, we examine the asset turnover of FDI by source country, and compare it with that of Canadian-owned entities.³ The asset turnover is defined as the ratio of operating revenue by total asset. It measures the efficiency of an asset in generating revenue (i.e. how much sales can be generated per unit dollar of asset). The data are collected by Corporations Returns Act (CRA) and available from Statistics Canada. Figure 3 summarizes the asset turnover of all industries (including manufacturing and services industries) by country of control over the recent period of 1999-2006. The US FDI was characterized by higher asset turnover than the FDI from EU and other foreign countries. It is also clear that Canadian-owned entities underperformed foreign ones in terms of asset efficiency. As for the manufacturing industries, Figure 4 suggests that the US FDI exhibited the highest asset turnover among other FDI. The FDI from EU countries also has higher asset turnover than Canadian-owned entities on average. The gap in asset efficiency, however, tended to be small when compared with the corresponding gap between the US FDI and Canadian-owned ones.

³ In theory, we could compare the labour productivity or total factor productivity between foreign and Canadian-owned entities. In practice, the unavailability of comprehensive firm-level data precludes us from such analysis. For example, while the Compustat database contains financial data at company level, the coverage of foreign companies in Canada is limited and focuses mainly on the US firms. If we search by country of incorporation with primary location in Canada, it turns out that the database only contains 157 US firms or 5% of total companies in Canada, 1 firm from Bermuda, 1 from Bahamas, and 1 from UK. The Canadian-owned firms therefore account for about 95% of the total companies in the database.

3. Literature Review

3.1 FDI and Host-Country Productivity

The existing literature has identified three possible channels through which inward FDI may positively affect host country productivity (see, e.g., Lipsey (2004)). The first channel is that foreign-controlled firms are more productive on average than domestic ones, so a rising share of them among the total population of firms within an industry will raise the average productivity in that industry. There is a large body of literature comparing the productivity between foreign-controlled and domestic firms, mostly for the manufacturing sectors in developing countries. For example, for developing countries, foreign-controlled firms are found to have higher labor and/or total factor productivity in Blomström and Wolff (1994) for Mexico, Kokko, Zejan, and Tansini (2001) for Uruguay, Haddad and Harrison (1993) for Morocco, Okamoto and Sjöholm (1999) for Indonesia, Chuang and Lin (1999) for Taiwan, Ramstetter (1999) for five East Asian countries (Hong Kong, Indonesia, Malaysia, Singapore and Taiwan), Erdilek (2002) for Turkey. Evidences are also found in developed countries such as Doms and Jensen (1998) for the US and Girma *et al.* (2001) for the U.K. In Canada, the higher productivity of foreign-controlled firms has been detected in studies of Globerman, Ries and Vertinsky (1994), Baldwin and Dhaliwal (2001), Rao and Tang (2005), and Baldwin and Gu (2005). Most of the studies comparing labor productivity between foreign-controlled and domestic firms show that higher capital intensity, larger size, more outsourcing of inputs and the use of advanced technologies are the possible reasons for foreign-controlled firms to have higher productivity. Nonetheless, the superior productivity performance of foreign-controlled firms has become a ‘stylized fact’ in the literature on FDI.

A second channel of the (positive) FDI impact on the performance of industries in host country is the productivity spillover from foreign-controlled firms to domestic firms. The productivity spillover may occur through technical connections, business model copying, and enhanced competition. However, it is noteworthy that an adverse impact may arise due to increased competition, which will raise the average costs of domestic competitors if they lose market share, therefore reducing their productivity. Theories of the effect of FDI on host countries have generally taken it for granted that foreign-controlled firms possess superior technology and that some of that technological knowledge spills over to the host-country economy, mainly within the same industry. However, the spillovers have proven to depend on absorptive capacity, competitive business environment, investment in learning, and imitation by competing host-country firms. Empirical studies give a mixed result along the line. For example, the positive FDI spillovers within the same industry has been found in Blomström (1983) and Kokko (1994) for Mexico, Kathuria (2000) for Indian “scientific” manufacturing sector, Haddad and Harrison (1993) for Morocco and Chuang and Lin (1999) for Taiwan, and the negative effect has been found in Aitken and Harrigan (1999) for Venezuela and Indonesia. A more recent paper by Wooster and Diebel (2006) reviews 32 empirical studies that model the contribution of FDI presence to local productivity in the host country through spillover effects such as those associated with technology transfer and

superior managerial know-how. Their findings suggest that spillover effects are more pronounced when the studies measure the effect of FDI spillovers on output, and are more likely to be significant and positive for Asian countries. Gu and Wang (2008) explain that the effects of knowledge spillover and market-share competition offset each other, and hence the net effect might be positive or negative. Using data on Canadian industries over the period of 1973-1992, Gera, Gu and Lee (1999) find that inward FDI has a positive and significant impact on the TFP growth of most Canadian industries, mainly through the reduction of production cost, technology transfer and international R&D spillover.

Most studies on the productivity spillovers of FDI assume that the effects occur mainly in the industries in which the foreign firms operate. The spillovers, however, may also take place in other supplying and purchasing industries in the host country, i.e. upstream and downstream industries, through backward and forward linkages. Thus, foreign-controlled firms in one industry may also influence (positively) the productivity performance of their suppliers (upstream industries), and users (downstream industries) in the host country through inter-industry linkages. As discussed in Gu and Wang (2008), domestic firms in the downstream industries of FDI may benefit from foreign-controlled firms as being suppliers of intermediate inputs in terms of more varieties, better quality, and lower cost of the intermediate inputs provided and better customer service. On the other hand, domestic firms in the upstream industries of FDI may receive management training and technical assistance from the foreign-controlled firms as being product users, and therefore raise their product quality. Accordingly, the spillovers occur when foreign-controlled firms are unable to extract the full value of the resulting productivity improvement. Blomström and Kokko (1998) point out that the spillovers may also come from the competition among local firms to become the suppliers to the multinationals. There are not many studies in the literature that empirically investigate the issue. Using data on the Canadian manufacturing industries from 1973 to 1997, Gu and Wang (2008) find strong and significant spillover effects of FDI on TFP growth through both forward and backward production linkages. Lileeva (2006) also finds significant spillovers of FDI in the Canadian manufacturing sector through forward linkages. For evidences from other countries, Javorcik (2004) documents substantial FDI spillovers to Lithuanian firms through backward linkages, and Aitken and Harrison (1991) report negative effects of FDI on upstream industries and positive effects of FDI on downstream industries in Venezuela.

A more general question is whether FDI can raise the productivity in host countries at aggregate industry or country level. Even if foreign-controlled firms are more productive than domestic firms and the superior productivity of foreign firms can spill over locally, the overall productivity effect may still be an empirical question. One possibility is that inward FDI might take over more efficient domestic firms and induce higher demand for foreign-produced inputs, leaving domestic firms either being less efficient or producing at lower side of value chain. This issue is rarely explored in the literature. Another related issue that has also been less explored is whether the potential host-country productivity impacts of inward FDI vary across the country sources of the foreign investment. The empirical analysis in this paper will shed some light on these

issues. But first, in the next sub-section, we review and compare some studies on the productivity differentials across different sources of FDI.

3.2 Sources of FDI and Productivity

Although there are a large number of studies examining the host-country productivity impacts of inward FDI, most of them do not consider the issue that the potential productivity benefits may greatly vary across the sources of FDI. In fact, it has been argued that the contributions of FDI originated from different countries may differ significantly due to substantial differences in the sophistication of technology/knowledge, managerial practices, motives and strategic approaches across countries of origin. In this subsection, we briefly review some of the few existing studies that disaggregate the productivity effects of inward FDI from different sources, and compare them.

Using data on 26 emerging market countries over the period 1989 through 1997, Kim, Lyn, and Zychowicz (2003) investigate whether economic growth in developing countries depends on the technology transfer they receive from FDI inflows. More specifically, they test whether technology transfer, *ceteris paribus*, depends on the attributes of FDI providers, particularly as they relate to the degree of technological advancement and the behavioural aspects of the technology transfer. The test is accomplished by looking at the impact on economic growth of FDI from two important and advanced FDI providers, Japan and the US, where multinational corporations (MNCs) domiciled in the two nations exhibit distinct variation in these attributes. They find some evidence that the relationship between the economic growth of the host countries and FDI inflows is stronger for the US-originated FDI than that of Japanese-originated FDI. They also find that the technology transfers from the US MNCs have an even greater impact for more economically disadvantaged countries. They contend that these findings are consistent with the notion that the US MNCs are more effective in generating technology transfers and spillovers to developing countries than do Japanese MNCs during the period under study.

In another developing country study, Banga (2004) posits that the spillover effects of FDI from different sources may differ as they come with different levels of technology and different modes of transferring the technology into different industries. He examines empirically the spillover effects of Japanese and the US FDI on the total factor productivity growth of the Indian firms, both at the firm and industry level. The results suggest that the presence of Japanese equity in the industry has a positive spillover effect while the market share of Japanese firms is negatively associated with the productivity growth of the Indian firms. However, the net spillover effect at the industry level is positive. The spillover effects from the US FDI are, however, not significant.

After showing that foreign-controlled establishments are more productive than domestically owned establishments in Canada, Globerman, Ries and Vertinsky (1994) examine whether the observed labor productivity level gaps are sensitive to the foreign affiliate's home country. Their regression analysis finds no significant differences in the performance of Canadian establishments owned by the US, European, and Japanese

firms. In other words, their findings suggest that foreign direct investment provides potential economic benefits to the Canadian economy, but reject the hypothesis that these benefits are sensitive to the source of direct investment. Thus, as policy recommendations, they conclude that targeting promotion activities to attract direct investment from specific countries should be attempted only if the sensitivities of investment to promotional efforts differ across countries, while the costs of promotion are relatively constant across countries.

Griffith and Simpson (2003) investigate the extent to which the lagging labor productivity level of U.K.-owned manufacturing establishments arises when compared to establishments of different foreign ownerships operating within Britain. First, considering establishments that do not change ownership nationality during the period under study, they find that North American-owned establishments have around 68% higher labor productivity than UK-owned, EU-owned around 53% higher, other European-owned 42% higher, Japanese-owned around 64% and other foreign around 77% higher. Second, with establishments that experience a change in ownership nationality (due to a takeover or merger), they find that domestic establishments that are taken over by foreign-owned firms, particularly North American-owned ones, improve their productivity faster after being taken over than establishments that go from being foreign to domestically owned. Two other U.K. studies by Harris (2002) and Harris and Robinson (2003) also use micro-based manufacturing data to test the differences in total factor productivity between U.K. domestic and different foreign ownerships. They both find that the US-owned plants typically perform better than U.K.-owned plants, and that overall there is little or no evidence of a clear productivity advantage of other foreign owned plants over domestic plants – other nationalities of ownership include EU, SE Asia, Old Commonwealth and/or the rest of the world.⁴

In a Swedish study using a panel of manufacturing firm data, Karpaty and Lundberg (2004) evaluate whether the effects of the presence of foreign-owned firms on the total factor productivity of domestic firms depend on the nationality of the foreign MNEs. Their results suggest that the US firms have a stronger positive effect on the productivity of Swedish-owned firms than FDI from the rest of the world. They argue that this may be due to a larger stock of firm specific knowledge that could be dispersed to local firms, or to an inability to prevent spillovers.

Using the US manufacturing plant-level data, Doms and Jensen (1998) examine the labor and total factor productivity differentials across the nationality of ownership. Although they report that foreign-owned establishments have higher productivity than the average US-owned establishment, there appear to be no large differences among foreign-owned establishments based on country of ownership. However, the establishments owned by the US multinationals are the most productive ones, followed by the establishments of foreign multinationals. Thus, they contend that what may be important in explaining productivity differences is ownership by a multinational rather than foreign ownership per se.

⁴ SE Asia includes Japan, Taiwan, Hong Kong, South Korea, and Malaysia, while Old Commonwealth comprises Australia, New Zealand, Canada and South Africa.

Finally, Benfratello and Sembenelli (2006) estimate the effect of foreign ownership on total factor productivity of firms located in Italy. After controlling for the simultaneity (or endogeneity) of the ownership variable, they find that nationality matters since firms under the US ownership tend to be significantly more productive than firms under other nationalities of ownership (including both domestic- and other foreign-owned firms, where the latter are found to be less productive than the former).

It emerges from this literature review that the host-country productivity impacts of inward FDI depend on the investment country (home country) or the nationality of the foreign MNEs, with sufficiently comprehensive evidence that the US-owned firms or US multinationals tend to outperform both local competitors and MNEs from other countries. In the next section, we set up an empirical framework to investigate (using industry panel data) whether there are differences in productivity growth impacts of inward FDI by country of origin in Canada.

4. Empirical Models, Data Measurements and Sources

The literature review in last section suggests that there are empirical evidences that inward FDI contributes significantly to economic growth. Besides, a number of country-specific studies find that the contributions of inward FDI originated from different countries or regions also matter for the productivity in the host country. In this section, we use industry-level panel data to examine whether inward FDI matters for the industry's productivity performance in Canada.

4.1 Empirical Models

Our first analysis is to investigate whether total inward FDI contributes to the productivity growth in Canada. To do so, we estimate the following equation:

$$TFPG_{it} = \alpha_0 + \alpha_1 FDI_{it-1} + \alpha_2 RDI_{it-1} + \alpha_3 MEI_{it-1} + \alpha_4 CAP_{it} + \delta_i + \gamma_t + \varepsilon_{it} \quad (1)$$

where i and t denote industry and time respectively; $TFPG_i$ is the TFP growth; FDI_i , RDI_i and MEI_i are the total inward FDI intensity, R&D intensity, and M&E capital intensity respectively; CAP_i is the capacity utilization rate; δ_i is the industry-specific fixed effect, γ_t is the time-specific effect; and ε_{it} is the error term.

The effect of total inward FDI is captured by the coefficient α_1 . A positive sign of this coefficient suggests that total inward FDI contributed positively to the TFP growth.

It has been identified in the literature that TFP growth can also be driven by technical change, which in turn is induced by fundamental and applied innovation. As discussed in Rao et al. (2008), fundamental innovation is affected by R&D activities while applied innovation or adoption and diffusion of new and state-of-art technologies is influenced by M&E capital. To control for the effect of technical changes induced by both fundamental

and applied innovation, we include the R&D intensity and M&E capital intensity as additional explanatory variables. The coefficients on RDI and MEI are expected to have a positive sign.

It is well known that business cycles can affect factor utilization in the short term (because of delays in factor adjustments to shocks), which in turn will affect TFP. We therefore include the change in capacity utilization, CAP , to account for the effect of business cycles on productivity growth.

As the main objective of the paper is to examine whether FDI from different countries or regions has a different impact on the productivity performance in Canada, our second analysis is to estimate the following equation:

$$TFPG_{it} = \beta_0 + \sum_j \beta_j FDI_{it-1}^j + \beta_2 RDI_{it-1} + \beta_3 MEI_{it-1} + \beta_4 CAP_{it} + \delta_i + \gamma_t + \varepsilon_{it} \quad (2)$$

where FDI_i^j is the inward FDI intensity by country/region j ; all other variables are defined the same as above.

If FDI from country or region j contributed positively to the industry's TFP growth, the coefficient on FDI_i^j (β_j) should have a positive sign. It should be noted that the industry's TFP growth in Equation (2) includes the productivity performance of both domestic and foreign firms within the same industry in Canada. Hence, the estimation of Equation (2) can only reveal whether FDI sources have an impact on the industry's TFP growth on average. As this econometric specification examines the impact on productivity growth of inward FDI within industry, a potential positive effect of FDI could be the result of the combination of higher productivity in the foreign owned firms and their productivity or technological spillovers to domestically owned firms. Thus, it cannot identify whether the sources of FDI have any spillover effect on domestic (Canadian-owned) firms. To estimate the spillover effect of FDI sources, it is necessary to measure separately the TFP growth for domestic- and foreign-owned firms by industrial sector in Canada. Unfortunately, the unavailability of TFP data for Canadian-owned firms precludes us to conduct the analysis directly. On the other hand, the availability of output data for domestic firms by industrial sector enables us to investigate whether country sources of FDI have any spillover impact on the output growth of domestic firms. To do so, we estimate the following equation:

$$OUTG_DOM_{it} = \rho_0 + \sum_j \rho_j FDI_{it-1}^j + \rho_2 RDI_DOM_{it-1} + \delta_i + \gamma_t + \varepsilon_{it} \quad (3)$$

where $OUTG_DOM_i$ is the output growth of domestic firms by industrial sector; RDI_DOM_i is the R&D intensity of domestic (Canadian-owned) firms by industry; all other variables are defined the same as above.

4.2 Data Measurements and Sources

The data used in this paper are obtained from various CANSIM tables of Statistics Canada, and the Globalization database of OECD. Annual data are used throughout the analysis. The data definitions and sources are described in details as follows.

TFP Growth (*TFPG*): it refers to the annual percentage change of the real multifactor productivity based on value-added. The multifactor productivity growth is the growth in output minus the output-share-weighted growth in labour and capital. The data are obtained from CANSIM Table 383-0022 of Statistic Canada. See Harchaoui et al. (2001) for detailed description of the data.

FDI Intensity (*FDI*): it refers to the inward FDI divided by the GDP for the corresponding industry. The FDI data are obtained from CANSIM Table 376-0052, and the GDP data are from CANSIM Table 383-0022.

R&D Intensity (*RDI*): it refers to the business enterprise R&D intramural expenditure divided by the GDP for the respective industry. Data for R&D are taken from CANSIM Table 358-0024.

M&E intensity (*MEI*): it refers to the real net stock of machinery and equipment divided by the GDP for the corresponding industry. The M&E stock data are obtained from CANSIM Table 031-0002.

Capacity utilization (*CAP*): it refers to by the ratio of cyclical GDP to trend GDP. The usual H-P filter is used to decompose the value-added into the trend and cyclical components. GDP data are obtained from CANSIM Table 383-0022.

Output Growth of domestic firms by industry (*OUTG_DOM*): it refers to the real gross output growth of Canadian-owned firms by industrial sector. The nominal gross output data for domestic firms are derived from using the nominal gross output level of multinationals in Canada and their respective share of production by industrial sector. The data for nominal output level and share of multinationals are taken from the Globalization database of OECD. The data for gross-output deflator are obtained from Canadian KLEMS database constructed by Statistics Canada.

R&D intensity of domestic firms by industrial sector (*RDI_DOM*): it refers to the R&D expenditure of Canadian owned firms divided by their respective gross output. The R&D expenditure data for domestic firms are derived from using the R&D expenditure of multinationals and their respective R&D share in Canada. The data for R&D level and share of multinationals are taken from the Globalization database of OECD. The data for gross output of domestic firms are constructed using the same method described as before.

Regarding the industry-level inward FDI data from different countries or regions, CANSIM Table 376-0052 enables us to construct two sets of balanced panel data for the period 1999 through 2007, including one with 3-region FDI sources and more industries, and the other with 4-region FDI sources and fewer industries. In particular, the 3-region

data covers FDI from the US, European and other regions (including Asian, other American and other countries) for 22 industries (by NAICS classification). On the other hand, the 4-region data covers FDI from the US, European, Asian and other regions (including other American and other countries) for only 13 industries.

After taking into account the availability of years for all data, we estimate Equations (1) and (2) using the 3-region and 4-region FDI sources data separately together with other explanatory variables for the sample period 1999 through 2005. On the other hand, Equation (3) is estimated using the 3-region FDI sources data for the sample period from 2000 to 2005.

5. Empirical Estimation Results

Before examining the impact of inward FDI on productivity performance, it is interesting to look at the average productivity performance for all industries under study and their distribution of FDI share by country/region. Table 3 reports the industrial-level average TFP growth over the period of 1999-2005 and the average country's/region's share of inward FDI in the corresponding industry for the same period. The wood product, primary metal, paper and transportation equipment manufacturing industries exhibited high productivity growth on average during 1999-2005 with TFP growth of over 3%. By contrast, the resource industries (mining, oil and gas extraction), electrical equipment and appliance, computer and electronic product manufacturing industries underperformed the average by recording negative TFP growth rates on average during the same period. Regarding the inward FDI distribution by country/region, the US had the highest FDI share in almost all industries with the average share (across industries and period from 1999-2005) of over 70%. The second highest FDI share came from European countries with the average share of about 23%. Other countries, including Asian, other American and other countries, had limited foreign investment in Canada with the average share of only about 6%. Finally, it is noteworthy that the industrial distribution of inward FDI in Canada does not give support to the view that FDI might be attracted to industries where firms on average happen to be more productive.

To assess the impact of inward FDI on productivity performance, we estimate Equations (1), (2) and (3) separately for the corresponding sample period as described in Section 3. We use the generalized least squares (GLS) estimator to correct for the heteroskedasticity across industries. Further, to reduce potential reverse causality issues, the lagged variables of FDI intensity, R&D intensity, and M&E capital intensity are used in the regression analysis.⁵

The estimation results for Equations (1) and (2) using the 3-region FDI source classification are summarized in Column A and B of Table 4 respectively.

⁵ The use of lagged explaining variables to reduce endogeneity issues have also been used by the literature on the study of causes of capital flight (e.g. Boyce 1992, Ndikumana & Boyce 2003, and Davies 2008).

The total inward FDI has a positive and significant effect on TFP growth. The coefficient suggests that a 1 percent-point increase in FDI intensity (as a share of GDP) leads to a 0.1% increase in TFP growth. This empirical finding is consistent with the theoretical discussion in Section 1 that inward FDI can enhance productivity in the host-country industries where they operate through two channels. The first channel is the direct effect of superior productivity efficiency in foreign affiliates. The second channel is the productivity or technological spillovers from inward FDI to domestic firms within the same industry.⁶

Besides, as expected, we also find that R&D intensity (a proxy for fundamental innovation) and capacity utilization (a proxy for business cycle effect) have a positive and significant impact on TFP growth. On the other hand, M&E capital intensity (a proxy for applied innovation) has a positive but insignificant effect on productivity growth.⁷

Turning to the question on whether country sources of inward FDI matter for productivity performance, the estimation result suggests that FDI from different regions does have a different impact on TFP growth. The FDI from the US has a positive and significant effect on productivity performance. A 1 percent-point increase in FDI intensity from the US results in a 0.13% increase in TFP growth. On the other hand, the FDI from European and other regions (including Asian, other American and other countries), however, tends to have no significant impact on productivity growth. As mentioned earlier, this finding of a positive impact of the US FDI could be the result of the higher productivity in the US-owned firms and/or the productivity or technological knowledge spillovers from the US to Canada via FDI. A recent existing study by Acharya and Keller (2009) lends support to these findings by reporting that the US domestic R&D spillovers to Canada are much larger than the spillovers from major European countries (such as Germany, France, and the UK). A potential explanation for this is that the US conducts most of the R&D in the world, and that the Canada-US economic relationship is the closest and most extensive among the industrialized countries.⁸ In addition, using data on management practices from the US, France, Germany, and the UK, Bloom and Van Reenen (2007) find that the US firms, on average, are better managed than European firms, and that managerial practices are strongly and positively associated with firm-level productivity.

We also use the 4-region FDI source classification to estimate Equation (1) and (2). The estimation results are summarized in Column A and B of Table 5 respectively. The regression results are similar to the findings from the 3-region classification. In particular, only FDI from the US has a positive and significant effect on TFP growth. A 1 percent-point increase in FDI intensity from the US leads to a 0.21% increase in TFP growth. On the other hand, FDI from Asian and European regions has no significant

⁶ This productivity impact of total inward FDI is consistent with the findings in a previous Industry Canada study by Ghosh and Wang (2008). Using OECD cross-country panel data, they find (among other things) that inward FDI is positively correlated with host country economic growth.

⁷ The insignificant impact of M&E capital intensity may reflect the fact that the TFP measure used in this paper is adjusted for the quality of capital inputs (see Harchaoui *et al.*, 2001).

⁸ Keller (2002) also provides evidence that international R&D spillovers vary substantially across bilateral relations.

impact on productivity growth. A new finding from the 4-region case is that FDI from other regions, including other American and other countries, has a negative and significant effect on TFP growth.

Recall that the observed positive productivity impact from the US FDI accords with and can be attributed to both superior productivity in the US foreign affiliates and their productivity spillovers to domestically owned firms. However, to investigate whether inward FDI exerts any positive spillover effect on the performance of Canadian-owned firms, we examine its impact on the output growth of domestic firms by industrial sector. To do so, we estimate Equation (3) using the 3-region FDI source classification and other control variables as mentioned above. The estimation result is presented in Table 6. Similar to the above findings about the effect of the US FDI on TFP growth, we also find that FDI from the US has a positive and significant impact on the output growth of domestic firms. Specifically, 1 percent-point increase in the US FDI intensity increases the output growth of domestic firms by 0.11%. This suggests that FDI from the US exerts positive spillovers on domestic output performance. By contrast, FDI from European region has no significant effect on domestic output growth, which is comparable to the above result that FDI from European region has no significant impact on the aggregate industry TFP growth. Interestingly, we also find that FDI from other regions (including Asian, other American and other countries) has a negative and significant effect on domestic output performance.

6. Conclusion

Foreign direct investment is widely believed to increase productivity in the receiving or host country. Although empirical research tends on balance to corroborate this view, it is not well known, however, whether the FDI productivity benefits to the host country are sensitive to the country sources of investment (home country) or the nationality/ownership of the foreign affiliates. If this happens to be the case, then some studies which aggregate all FDI or foreign-owned firms may be missing impacts, and indeed it may be that ‘good’ and ‘bad’ countries or regions discount one another, leading to no overall significant effect.

This paper contributes to the literature on host-country productivity impacts of inward direct investment by examining whether FDI from different countries or regions has a differential impact on the productivity growth in Canada. Using industry panel data, the regression analysis shows that the country of origin matters. More specifically, the FDI originated from the US has a significant positive impact on TFP growth in industries in which it operates, while the FDI from European and other regions have no significant impact. These findings are consistent with both higher productivity of the US-owned firms and technological knowledge spillovers from the US to Canada. They are also in line with some previous studies which report that the US domestic R&D spillovers to Canada are much larger than the spillovers from major European countries. Moreover, our results also show that foreign investment from the US generates positive productivity spillovers to Canadian-owned firms within the same industries. These overall results

accord with the findings from other countries' studies that explored the productivity differentials of inward FDI across the home countries. These existing studies report that the US-owned firms or US multinationals tend to outperform both local competitors and MNEs from other countries. An interesting topic for future research would be to explore in details *why* the productivity impacts of inward FDI differ across the country of origin.

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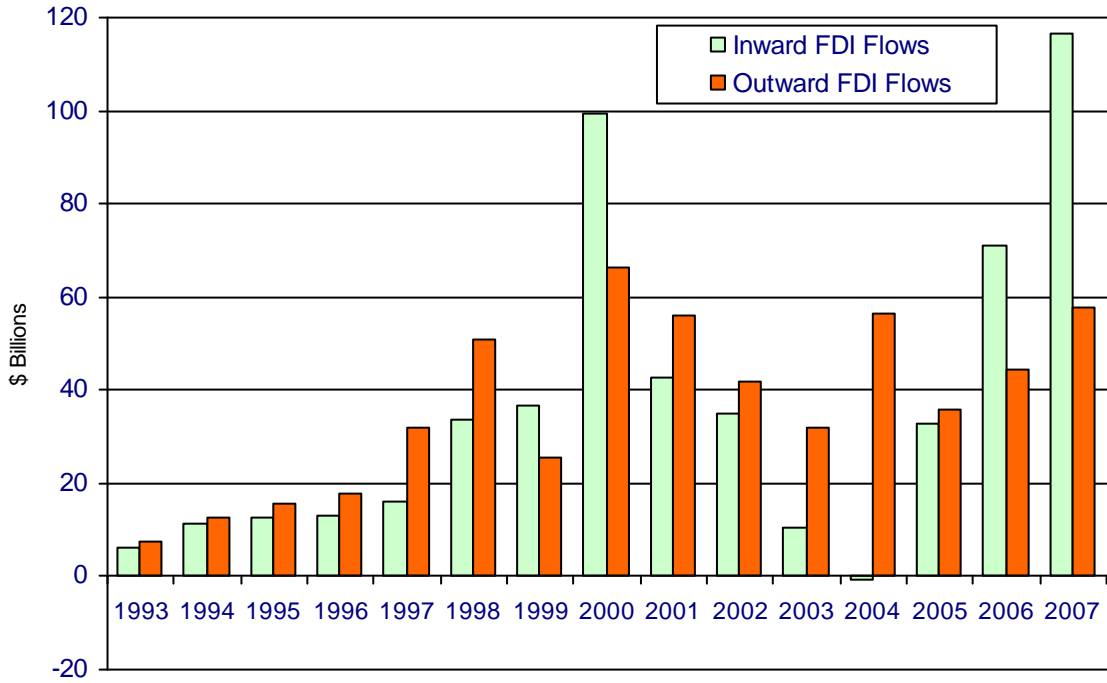
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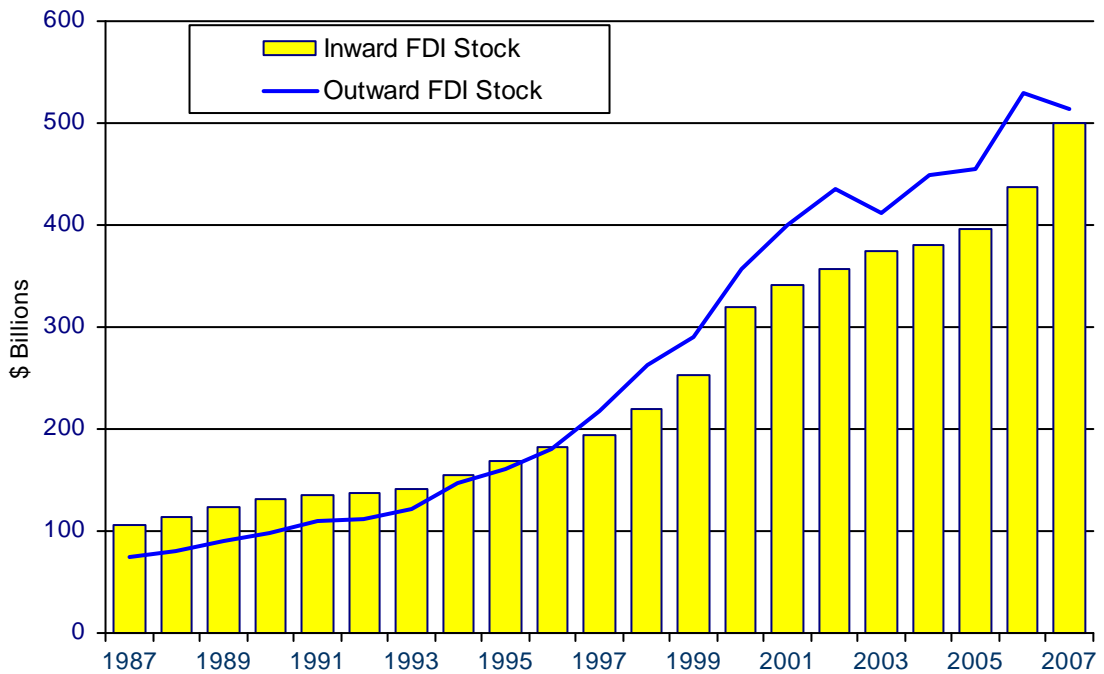
Charts & Tables

Figure 1: FDI Flows into Canada and CDIA, 1993-2007 (Billions CAD)



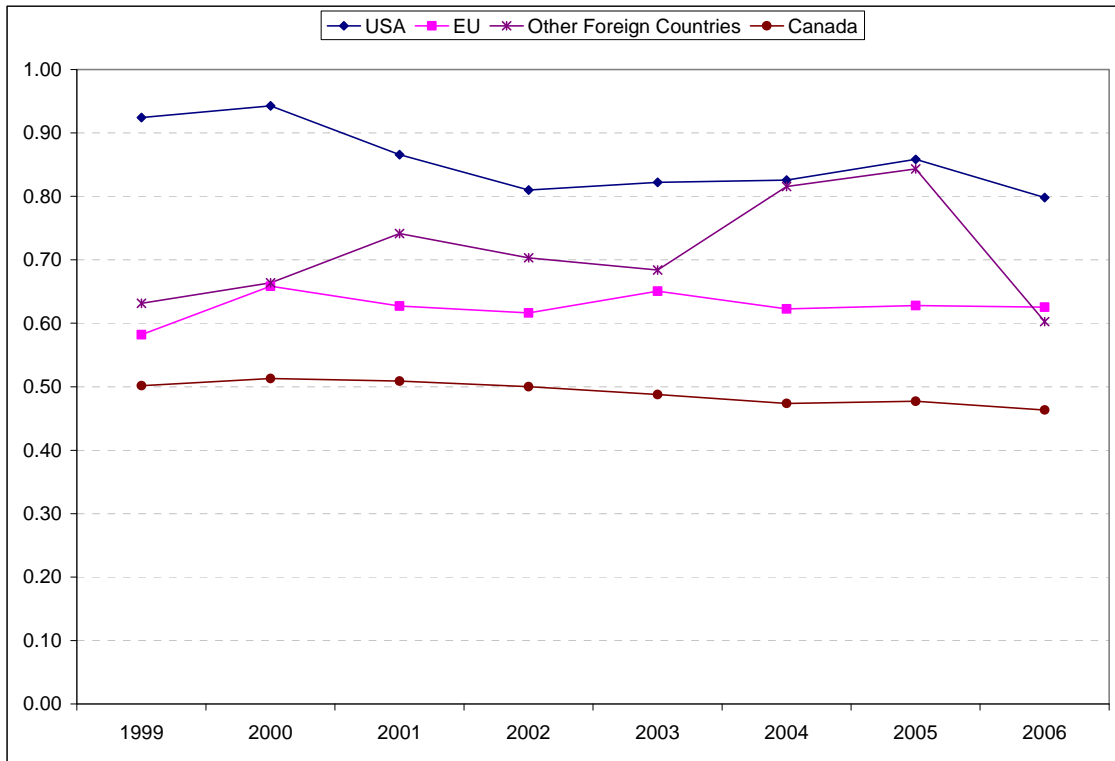
Source: Statistics Canada

Figure 2: FDI Stocks in Canada and CDIA, 1987-2007 (Billions CAD)



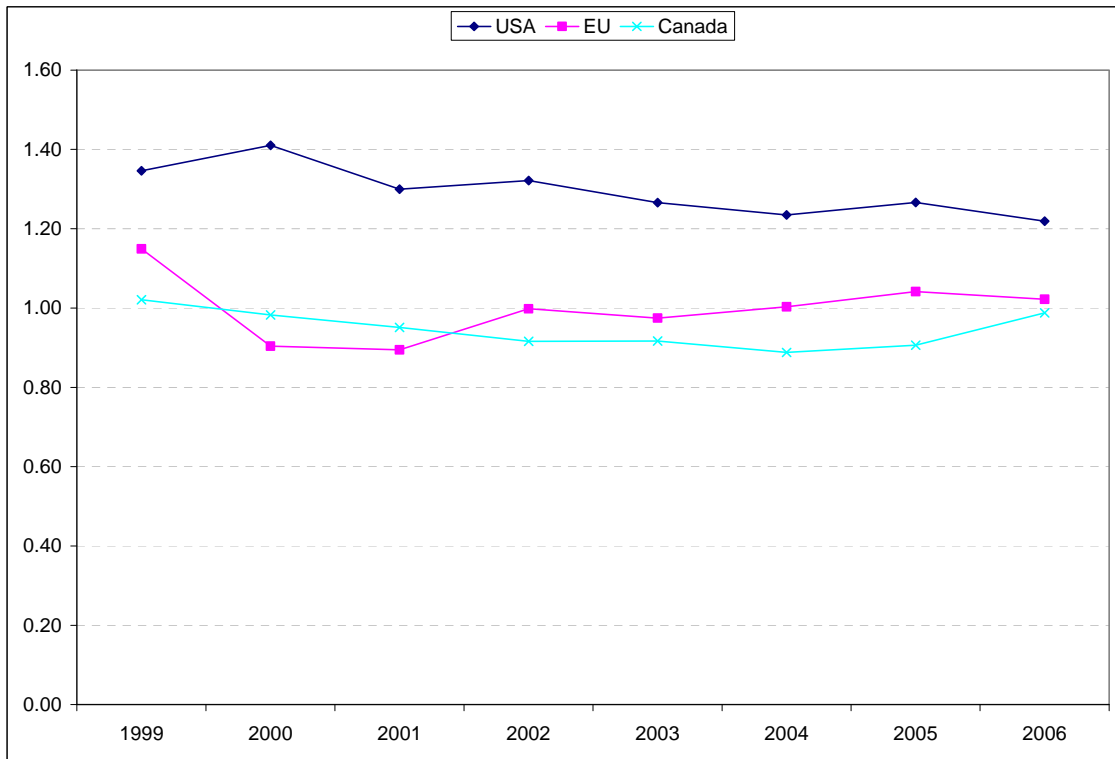
Source: Statistics Canada

Figure 3: Asset Turnover of All Industries in Canada: by Country of Control



Source: Statistics Canada

Figure 4: Asset Turnover of Manufacturing Industries in Canada: by Country of Control



Source: Statistics Canada

Table 1: Source of Canada's Inward FDI Stock (Billions CAD)

– Ranked by top-10 sources in 2007 –

Region	1995	2002	2007	World Share in 1995	World Share in 2002	World Share in 2007
World	168.2	356.8	500.9	100.0	100.0	100.0
United States	112.9	231.6	288.6	67.2	64.9	57.6
United Kingdom	14.1	27.6	54.8	8.4	7.7	10.9
Netherlands	6.3	14.7	31.5	3.7	4.1	6.3
France	5.7	31.6	17.4	3.4	8.9	3.5
Switzerland	3.4	7.0	13.8	2.0	2.0	2.8
Japan	7.0	9.3	13.4	4.2	2.6	2.7
Brazil	0.3	0.8	12.8	0.2	0.2	2.6
Germany	5.0	6.8	10.5	3.0	1.9	2.1
Sweden	0.9	1.8	8.5	0.5	0.5	1.7
Luxembourg	0.1	2.8	7.0	0.1	0.8	1.4

Source: Statistics Canada

Table 2: Industry Shares in Canada's Inward FDI Stock (percent)

– Ranked by descending values in 2007 –

Region	Share in 1995	Share in 2002	Share in 2007
	(168.2 B CA\$)	(356.8 B CA\$)	(500.9 B CA\$)
All industries	100	100	100
Finance and insurance industry	17.3	18.3	20.6
Energy	11.6	17.5	17.3
Metallic minerals and metal products	5.7	6.0	13.0
Services and retailing industry	10.0	8.1	10.3
Chemicals, chemical products and textiles	11.9	8.9	8.6
Transportation equipment	10.7	10.7	7.2
Food, beverage and tobacco	8.9	10.8	6.2
Electrical and electronic products	6.9	7.2	5.9
Wood and paper industry	6.0	4.2	3.5
Machinery and equipment	4.3	3.3	3.2
Construction and related activities	4.7	2.9	2.7
Communications	1.9	2.2	1.6

Source: Statistics Canada

Table 3: Productivity Growth by Industries and Respective FDI Share by Countries

Industries by NAICS	TFP Growth (%, average 1999-2005)	Inward FDI Share by Countries (% Share of FDI in Respective Industry, average 1999-2005)		
		US	European	Other
			Countries	Countries
Wood product manufacturing [321]	4.0	68.3	14.6	17.1
Primary metal manufacturing [331]	3.7	43.5	43.9	12.6
Paper manufacturing [322]	3.3	72.4	23.6	4.0
Transportation equipment manufacturing [336]	3.2	80.1	7.4	12.6
Non-metallic mineral product manufacturing [327]	2.6	72.8	27.2	0.0
Machinery manufacturing [333]	2.3	67.4	29.4	3.2
Information and cultural industries [51]	2.1	77.3	22.0	0.7
Plastics and rubber products manufacturing [326]	2.0	71.6	22.2	6.2
Wholesale trade [41]	2.0	62.5	25.7	11.8
Retail trade [44-45]	1.9	93.2	4.8	2.0
Chemical manufacturing [325]	1.6	61.7	35.7	2.6
Accommodation and food services [72]	1.2	71.1	13.0	15.9
Food manufacturing [311]	1.1	79.2	18.7	2.1
Construction [23]	0.8	59.7	34.7	5.6
Fabricated metal product manufacturing [332]	0.8	82.4	16.5	1.2
Textile and Textile product mills [313, 314]	0.8	56.9	42.9	0.4
Professional, scientific and technical services [54]	0.6	63.9	32.5	3.6
Transportation and warehousing [48-49]	0.4	62.5	32.2	5.3
Finance and insurance, real estate and rental and leasing [52, 53]	0.0	68.4	27.3	4.3
Computer and electronic product manufacturing [334]	-0.2	87.5	10.2	2.3
Electrical equipment, appliance and component manufacturing [335]	-1.6	73.2	25.1	1.7
Mining and oil and gas extraction [21]	-4.3	79.6	6.3	14.0
Weighted Average*	0.9	72.1	20.7	7.2

*Industry's value-added and FDI shares are used to compute the weighted average for TFP growth and FDI share by country respectively.

Source: Authors' estimates

Table 4: GLS Estimation Results - 3-Region FDI Source Classification

Dependent Variable: TFP Growth (TFPG _t)	(A)	(B)
<u>Explaining Variables</u>		
Total Inward FDI Intensity (FDI _{t-1})	0.104*** (0.039)	
Inward FDI Intensity by US (FDI_US _{t-1})		0.128*** (0.040)
Inward FDI Intensity by European Region (FDI_EUR _{t-1})		0.061 (0.118)
Inward FDI Intensity by Other Regions (FDI_Oth _{t-1})		-0.333 (0.263)
R&D Intensity (RDI _{t-1})	0.854*** (0.242)	0.897*** (0.242)
M&E Capital Intensity (MEI _{t-1})	0.058 (0.110)	0.079 (0.109)
Capacity Utilization (CAP _t)	0.822*** (0.111)	0.832*** (0.112)
Industry-Specific Effect	YES	YES
Time-Specific Effect	YES	YES
Number of Industries	22	22
Number of periods	7	7
Wald Chi-Square Statistics	169.43***	172.19***

All specifications include a constant term. Standard errors are in parentheses.

***Statistically significant at 1%

Source: Authors' estimates

Table 5: GLS Estimation Results - 4-Region FDI Source Classification

Dependent Variable: TFP Growth (TFPG _t)	(A)	(B)
<u>Explaining Variables</u>		
Total Inward FDI Intensity (FDI _{t-1})	0.224*** (0.044)	
Inward FDI Intensity by US (FDI_US _{t-1})		0.210*** (0.051)
Inward FDI Intensity by European Region (FDI_EUR _{t-1})		0.197 (0.154)
Inward FDI Intensity by Asian Region (FDI_ASIA _{t-1})		0.296 (0.518)
Inward FDI Intensity by Other Regions (FDI_Oth _{t-1})		-1.241 (0.451)
R&D Intensity (RDI _{t-1})	0.807*** (0.202)	1.066*** (0.223)
M&E Capital Intensity (MEI _{t-1})	-0.054 (0.186)	-0.141 (0.176)
Capacity Utilization (CAP _t)	0.989*** (0.118)	0.988*** (0.121)
Industry-Specific Effect	YES	YES
Time-Specific Effect	YES	YES
Number of Industries	13	13
Number of periods	7	7
Wald Chi-Square Statistics	160.27***	178.5***

All specifications include a constant term. Standard errors are in parentheses.

***Statistically significant at 1%

Source: Authors' estimates

Table 6: GLS Estimation Results - 3-Region FDI Source Classification
 Effect of FDI on Domestic Output Growth

Dependent Variable: Domestic Output Growth (OUTG_DOM_t)

Explaining Variables

Inward FDI Intensity by US (FDI_US _{t-1})	0.115* (0.065)
Inward FDI Intensity by European Region (FDI_EUR _{t-1})	-0.175 (0.239)
Inward FDI Intensity by Other Regions (FDI_Oth _{t-1})	-0.859** (0.439)
R&D Intensity (RDI_DOM _{t-1})	3.793*** (1.285)
Industry-Specific Effect	YES
Time-Specific Effect	YES
Number of Industries	16
Number of periods	6
Wald Chi-Square Statistics	47.29***

All specifications include a constant term. Standard errors are in parentheses.

***Statistically significant at 1%, **Statistically significant at 5%, *Statistically significant at 10%

Source: Authors' estimates